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## Catastrophizing and Causal Beliefs in Whiplash

J. Buitenhuis, MD,\* P. J. de Jong, PhD,† J. P. C. Jaspers, PhD,‡ and J. W. Groothoff, MSc, PhD§

**Study Design.** Prospective cohort study.

**Objective.** This study investigates the role of pain catastrophizing and causal beliefs with regard to severity and persistence of neck complaints after motor vehicle accidents.

**Summary of Background Data.** In previous research on low back pain, somatoform disorders and chronic fatigue syndrome, pain catastrophizing and causal beliefs were found to be related to perceived disability and prognosis. Furthermore, it has been argued with respect to whiplash that culturally dependent symptom expectations are responsible for a chronic course.

**Methods.** Individuals involved in traffic accidents who initiated compensation claim procedures with a Dutch insurance company were sent questionnaires (Q1) containing the Neck Disability Index, the Pain Catastrophizing Scale, and the Causal Beliefs Questionnaire–Whiplash. Of 1252 questionnaires dispatched, 747 (59.7%) were returned. Only car occupants with neck complaints were included in this study ( $n = 140$ ). Complaints were monitored using additional questionnaires administered 6 (Q2) and 12 months (Q3) after the accident.

**Results.** Pain catastrophizing and causal beliefs were related to the severity of concurrent whiplash disability. The severity of initial complaints was related to the severity and persistence of whiplash complaints. Attributing initial neck complaints to whiplash was found to predict the persistence of disability at 6 and 12 months follow-up, over and above the severity of the initial complaints.

**Conclusion.** The results suggest that causal beliefs may play a major role in the perceived disability and course of neck complaints after motor vehicle accidents, whereas pain catastrophizing is predominantly related to concurrent disability.

The current findings are consistent with the view that an early conviction that neck complaints are caused by the medico-cultural entity whiplash has a detrimental effect on the course of symptoms.

**Key words:** postwhiplash syndrome, whiplash associated disorder, WAD, pain catastrophizing, casual attributions, illness beliefs, whiplash culture. *Spine* 2008; 33:2427–2433

In recent decades, whiplash has become the most common diagnosis following motor vehicle accidents.<sup>1</sup> In its acute phase whiplash is defined as myogenic neck complaints after a sprain of the neck.

Although the majority of patients show spontaneous recovery within the first few months after a traffic accident, in as many as 40% of cases these acute complaints lead to a chronic syndrome with neck pain and often cognitive complaints.<sup>2–4</sup> This chronic syndrome is often referred to as late or postwhiplash syndrome, characterized by unexplained physical and cognitive symptoms. Although still subject to debate, a general consensus is building that postwhiplash syndrome should be regarded as a functional somatic syndrome in which cultural as well as psychological factors play a major role.<sup>5,6</sup>

Postwhiplash syndrome can lead to invalidating effects and long-term work disability.<sup>7,8</sup> It is therefore of paramount importance to gain insight into the factors responsible for this chronic course.

Earlier work in the context of other chronic disorders characterized by unexplained physical complaints, such as chronic low back pain, provided evidence to suggest that pain catastrophizing and attributional bias are of crucial importance in the development of chronic complaints.<sup>9</sup> In the Fear-Avoidance model for chronic musculoskeletal pain, the pathway from pain experience to fear, anxiety, and avoidance, leading ultimately to disuse and disability, is modulated by catastrophizing and threatening illness beliefs.<sup>10</sup> Similar mechanisms may also apply to chronic neck complaints.<sup>4,11,12</sup> Preliminary support for this comes from recent studies showing that fear of pain and the presence of relatively intense anxiety symptoms are related to poor prognosis of neck complaints following motor vehicle accidents.<sup>4,13</sup>

Pain catastrophizing refers to an exaggeratedly negative orientation towards actual or anticipated pain.<sup>14</sup> Earlier research has found that the habitual tendency to make catastrophic interpretations of pain is associated with a heightened pain experience in various patient groups.<sup>15</sup> Furthermore, catastrophizing has been associated with heightened disability in chronic pain, independent of the level of actual physical impairment.<sup>16–18</sup>

The first aim of the present study is to investigate whether pain catastrophizing is similarly involved in the development of chronic neck pain following motor vehicle accidents. In addition, this study investigated the role of “causal illness beliefs.”

Causal illness beliefs can be defined as the patient’s ideas about the origin or cause of the symptoms or illness experienced. It has been found in chronic fatigue syn-

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drome that somatic illness beliefs are associated with increased symptoms and functional impairment, worse subjective and objective outcomes and poor prognosis.<sup>19,20</sup> In somatoform disorders organic causal attributions are associated with a need for medical diagnostic examinations, increased expression of complaints and body scanning.<sup>21</sup> In addition, inadequate illness beliefs were found to be associated with heart-focused anxiety.<sup>22</sup>

In a similar vein, dysfunctional causal beliefs may also apply to myogenic neck complaints after motor vehicle accidents. Dysfunctional causal beliefs can be defined as the attribution of the cause of acute myogenic neck complaints to severe, neural or irreparable causes. At the chronic stage, somatic or organic beliefs in general can be considered dysfunctional.

Medical interpretation and explanation of myogenic neck pain after motor vehicle accidents by general practitioners or emergency room staff, commonly held knowledge and culturally defined ideas may give rise to dysfunctional illness beliefs regarding the cause of the neck complaints, which in turn may result in a chronic course.<sup>23</sup>

Furthermore, dysfunctional causal beliefs are thought to be caused or fuelled by culturally embedded beliefs regarding the course and severity of whiplash. It has been demonstrated that symptom expectations for whiplash differ between countries known to have different prevalence figures for chronic whiplash.<sup>24–29</sup> Accordingly, it has been argued that these symptom expectations, and hence the attribution of complaints to whiplash, are responsible for more severe and prolonged complaints.<sup>23,27,28</sup>

Additionally, it is conceivable that pain catastrophizing leads to more dysfunctional causal beliefs. The tendency to attribute neck complaints to irreparable or severe causes in its turn may elicit catastrophic interpretations of potentially benign myogenic symptoms. Catastrophizing and dysfunctional causal beliefs could thus lead to a negative spiral, augmenting symptom severity and discharging into irrational expectations regarding the course of the symptoms and disability, fuelling a chronic course.<sup>10,30</sup>

In sum, this prospective study examined the predictive validity of catastrophizing and causal beliefs in the development of postwhiplash syndrome after motor vehicle accidents. More specifically, we tested the following predictions:

1. Pain catastrophizing and causal beliefs—especially the attribution of neck complaints to whiplash—are related to more severe whiplash complaints.
2. Pain catastrophizing and causal beliefs—especially the attribution of neck complaints to whiplash—hamper the recovery from acute whiplash complaints.

## ■ Materials and Methods

### *Study Design*

We used a prospective longitudinal design. Participants were assessed at 1 (Q1), 6 (Q2), and 12 months (Q3) after their accidents.

### *Participants and Procedure*

Traffic-accident victims who had initiated compensation claim procedures for personal injury with a Dutch insurance company were asked to participate in this study. In the Netherlands, the settlement of personal injury claims is based on liability insurance with the accident victims seeking compensation from the insurance company of the driver at fault.

During the intake period, 1252 questionnaires were dispatched. Questionnaires were not sent to victims known to be younger than 18 or older than 65. The number of initial questionnaires returned was 747 (59.7%). Nonresponse analysis revealed no significant difference in age (*t* test, *P* = 0.98) and gender ( $\chi^2$ , *P* = 0.20).

The initial selection from the returned questionnaires included only the responses of victims with neck complaints at Q1 who had been involved as drivers or passengers in a car accident (*n* = 156).

To rule out the potentially confounding influence of concurrent complaints and to obtain a homogeneous sample of participants with only soft tissue injuries, 16 victims were excluded because of a history of whiplash or other chronic pain, 1 or more fractures, or a loss of consciousness of longer than 1 minute. In the final sample therefore, 140 participants' responses were eligible for further analysis.

### *Questionnaires and Outcome Variables*

After a median time of 25 days (mean 26.44 days, SD = 9.32) after the accident, we sent each claimant a questionnaire (Q1) concerning the accident, the injuries they had sustained, and their complaints at that time.

Consistent with our previous studies on postwhiplash syndrome, participants suffering from neck pain, loss of consciousness of no longer than 1 minute and no self-reported previous neck complaints were included as postwhiplash syndrome patients.<sup>3,4,13</sup>

Disability was measured using the Neck Disability Index (NDI). The NDI consists of 10 items with a 6-point scale, addressing functional activities (personal care, lifting, reading, work, driving, sleeping, and recreational activities), pain intensity, concentration, and headache.<sup>31</sup> The NDI has been shown to be valid, reliable, and sensitive to change in a population of patients suffering from neck pain and showed a high internal consistency.<sup>31</sup>

Pain catastrophizing was measured using the Pain Catastrophizing Scale (PCS).<sup>14,32</sup> The PCS is a 13-item self-report measure asking participants to reflect on past painful experiences and to indicate the degree to which they experience thoughts or feelings during pain on a 5-point scale, ranging from 0 (not at all) to 4 (always). Previous research showed that the PCS has adequate psychometric properties, with good temporal stability (Pearson's  $r^2$  = 0.92) and adequate internal consistency.<sup>33</sup>

To assess the participants' causal beliefs of post-traumatic neck complaints we used the Causal Beliefs Questionnaire Whiplash (CBQ-W), which was developed for this study. This CBQ-W was developed by defining 4 dimensions of causations, based on clinical experience and known causes of cervical

**Table 1. The Causal Beliefs Questionnaire Whiplash (CBQ-W), With Factor Loadings After VARIMAX Rotation**

	Components				
	1	2	3	4	5
Eigenvalues	4.825	2.353	1.796	1.381	1.151
Reliability (Cronbach's alpha)	0.838†	0.778*	0.830*	0.671‡	0.490*
My complaints are caused by					
5. Me being emotionally upset	0.872	—	—	—	—
18. Me being afraid of something	0.825	—	—	—	—
13. Me being shocked by the accident	0.808	—	—	—	—
7. Me being under psychological pressure	0.692	—	—	—	—
9. Something being broken in my neck	—	0.787	—	—	—
10. Damage to my spinal cord	—	0.689	—	—	—
15. Brain injury	—	0.586	—	—	—
17. My nerves not working properly	—	0.568	—	—	—
11. A muscle tear	—	0.537	—	—	—
8. Something being irreparably damaged	—	0.446	—	—	—
12. My vertebrae not lining up	—	—	0.856	—	—
6. Something to do with my vertebrae	—	—	0.832	—	—
16. My vertebrae being shifted	—	—	0.827	—	—
3. Spraining of my neck muscles or ligaments	—	—	—	0.770	—
1. Something to do with my muscles or ligaments	—	—	—	0.757	—
14. Bruising of my muscles or ligaments	—	—	—	0.748	—
4. Whiplash	—	—	—	—	0.775
2. Nerve injury	—	—	—	—	0.732

Only factor loadings &gt;0.4 printed.

\*n = 137; †n = 138; ‡n = 139.

symptoms—a muscle or ligament injury, a vertebral injury, a neural or cerebral injury and psychological factors. Four questions were formulated for each dimension covering different injury severities (Table 1). Finally, 2 questions were added (items 4 and 8) to test specific beliefs—*i.e.*, that the cause of symptoms is “whiplash” and something is irreparably damaged—not specifically related to 1 of the 4 dimensions.

The questionnaire starts with “My complaints are caused by” or perhaps after followed by 18 possible causes as listed in Table 1. Participants were asked to indicate on a 4-point scale (absolutely not, probably not, probably yes or absolutely yes) whether the particular origin is likely to be correct.

Furthermore, all patients completed a standardized self-administered questionnaire.

The presence (yes/no) and severity (NDI score) of postwhiplash syndrome at Q1, Q2, and Q3 were defined as general outcome variables.

### Data Reduction

**Causal Beliefs Questionnaire Whiplash.** By means of exploratory factor analysis (principal component analysis with VARIMAX rotation), the factor structure of the CBQ-W was investigated. On the basis of their eigenvalues and through the inspection of the scree plot, 5 factors were found (Table 1).

Factor 1 contains items referring to an expected psychological origin of the complaints (CBQ-W Psychological). Factor 2 contains items referring to an expected severe injury as the cause of the complaints (CBQ-W Severe Injury). Factor 3 (CBQ-W Vertebral) contains items referring to an expected vertebral origin of the complaints, with the exception of “something broken in my neck” (item 9), which loads on factor 2. Factor 4 (CBQ-W Muscular) contains items regarding the expected muscular origin of the complaints, with the exception of “there is a muscle tear” (item 11) which was included in factor 2 because of its higher factor loading. Due to the unsat-

isfactory reliability of factor 5, it was not used in the further analysis. Instead item 4 (“My complaints are caused by whiplash”) was included as a possible predictive variable in the analysis (CBQ-W Whiplash) for its specific attributional value.

All in all, the factor structure obtained has face validity and reflected 4 theoretically meaningful dimensions that came close to our *a priori* dimensions. We have therefore used the mean value of the obtained factor scales in the subsequent analyses.

### Results

Table 2 provides an overview of the basic characteristics of the participants at Q1, Q2, and Q3.

**Table 2. Overview of the Basic Characteristics of Participants With Postwhiplash Syndrome at Q1 (1 Month), Q2 (6 Months), Q3 (12 Months) After the Accident**

	Q1	Q2	Q3
N	140	122	110
Postwhiplash syndrome, no. (%)	140 (100)	81 (66.4)	62 (56.4)
Gender, female (%)	95 (67.9)	56 (69.1)	43 (69.4)
Age, mean (SD)	36.4 (12.0)	35.6 (12.3)	36.9 (12.8)
NDI score, mean (SD)	16.7 (8.9)	16.7 (8.3)	17.4 (8.0)
Severity of paresthesia, mean (SD)	2.6 (2.4)	3.2 (2.6)	3.1 (2.6)
Radiating pain in arms, mean (SD)	3.3 (2.6)	3.3 (2.7)	3.7 (2.8)
PCS			
Total, mean (SD)	12.94 (11.3)	13.78 (10.97)	13.82 (11.49)
CBQ-W			
Psychological, mean (SD)	1.69 (0.82)	1.74 (0.80)	1.79 (0.83)
Severe injury, mean (SD)	1.45 (0.40)	1.55 (0.42)	1.57 (0.47)
Vertebral, mean (SD)	1.91 (0.74)	2.13 (0.86)	1.94 (0.77)
Muscular, mean (SD)	2.97 (0.69)	2.73 (0.82)	2.55 (0.85)
Whiplash, mean (SD)	2.45 (0.88)	2.86 (1.07)	2.87 (1.11)



**Table 3. Spearman Correlations Between PCS and CBQ-W Factors, and Concurrent Neck Disability Index (NDI) Scores, at Q1, Q2 and Q3**

	NDI		
	Q1 (n = 140)	Q2 (n = 81)	Q3 (n = 62)
PCS at Q1	0.58*	—	—
CBQ-W at Q1			
Psychological	0.39*	—	—
Severe injury	0.41*	—	—
Vertebral	0.31*	—	—
Muscular	0.32*	—	—
Whiplash	0.36*	—	—
PCS at Q2	—	0.58*	—
CBQ-W at Q2			
Psychological	—	0.32*	—
Severe injury	—	0.49*	—
Vertebral	—	0.31*	—
Muscular	—	0.36*	—
Whiplash	—	0.57*	—
PCS at Q3	—	—	0.52*
CBQ-W at Q3			
Psychological	—	—	0.33*
Severe injury	—	—	0.63*
Vertebral	—	—	0.43*
Muscular	—	—	0.41*
Whiplash	—	—	0.53*

Correlation is significant at the 0.05 level (2-tailed).

\*Correlation is significant at the 0.01 level (2-tailed).

Of 140 participants in the final sample, 18 did not return the second and third questionnaires, and 12 did not return the third questionnaire. Analysis indicated no significant differences with respect to scores during the first assessment between those who did and those who did not return the questionnaires.

#### **Relationship Between the CBQ-W, PCS, and Neck Disability Scores**

To explore the relationship between the PCS, the CBQ-W factors and the concurrent NDI scores, Spearman correlation coefficients were calculated (Table 3).

In line with predictions, the correlational analysis shows that on all 3 occasions pain catastrophizing is associated with a higher concurrent NDI score.

Similarly, the CBQ-W factors are also correlated with a higher concurrent NDI score at Q1, Q2, and Q3.

To explore the independent contribution of pain catastrophizing and the various types of causal beliefs we carried out a multiple linear regression analysis using the NDI score as the dependent variables at Q1, Q2, and Q3, respectively, and the concurrent PCS score, CBQ-W factors, age and gender as predictor variables.

Table 4 shows the results after backward stepwise elimination while retaining age and gender. Pain catastrophizing scores show an independent relationship with the concurrent NDI score on all 3 occasions.

All CBQ-W factors, with the exception of CBQ-W Severe Injury and CBQ-W Psychological, are independently related to the NDI score at Q1. The CBQ-W Whiplash also contributes independently to the concur-

rent NDI score at Q2 and Q3. Analysis at Q3 also reveals that CBQ-W Severe Injury is significantly related to the concurrent NDI score.

Age and gender provide no significant contributions to any of the models.

#### **The Prognostic Value of Causal Beliefs and Pain Catastrophizing for the Persistence of Postwhiplash Syndrome**

Table 5 shows the results of 2 multiple logistic regression models after stepwise backward modeling, while retaining age and gender, using the persistence of postwhiplash syndrome at Q2 (model 1) and Q3 (model 2) as dependent variables, and the variables from Q1 as predictor variables.

The NDI score at Q1 shows a significant relationship with the persistence of postwhiplash syndrome at Q2 and Q3. Most importantly for the present context, the results indicate that the CBQ-W Psychological and CBQ-W Whiplash factors at Q1 have independent predictive value for the presence of postwhiplash syndrome at Q2 and Q3, over and above the NDI score at Q1.

With regard to the presence of postwhiplash syndrome at Q2, CBQ-W Vertebral also shows a significant contribution, whereas the PCS score was found to be statistically significant, yet with an odds ratio of <1, which indicates a negative contribution. However, univariate logistic regression analysis reveals a small positive relationship between the PCS score at Q1 and the persistence of post-whiplash syndrome at Q2 (odds ratio = 1.044, 95% CI = 1.001–1.088,  $P = 0.042$ ) and Q3 (odds ratio 1.061, 95% CI = 1.017–1.108,  $P = 0.006$ ).

#### **Discussion**

The major results of the present study can be summarized as follows:

- The severity of neck disability at 1, 6, and 12 months follow-up is associated with concurrent pain catastrophizing.
- The severity of early complaints is related to the persistence of whiplash at 6 and 12 months follow-up.
- Attributing initial neck complaints to whiplash was found to be related to more severe concurrent disability and to have prognostic value for the persistence of whiplash at 6 and 12 months follow-up, over and above the initial complaint severity.

Consistent with research into chronic pain, pain catastrophizing was found to be related to concurrent neck disability.<sup>16,18</sup> Because of the correlational design of the present findings it is not possible to determine whether more severe disability leads to more pain catastrophizing or *vice versa*. However, since early pain catastrophizing was not found to have independent prognostic value for whiplash complaints at 12 months follow-up, the present pattern of findings provides no convincing support for the idea that pain catastrophizing plays an important role in the generation and persistence of whiplash complaints.

**Table 4. Multiple Linear Regression Model**

Variable	Coefficients ( $\beta$ )	Standard Error	95.0% CI		Standard Coefficients (B)	<i>t</i>	<i>P</i>
			Lower	Upper			
Dependent variable: neck disability index at Q1, independent variables from Q1							
Age	0.05	0.05	−0.05	0.14	0.06	0.898	0.371
Gender	1.37	1.29	−1.19	3.93	0.07	1.061	0.291
CBQ-W psychological	1.58	0.93	−0.26	3.43	0.15	1.701	0.091
CBQ-W vertebral	2.33	0.82	0.71	3.95	0.19	2.845	0.005
CBQ-W muscular	2.31	0.89	0.55	4.06	0.18	2.600	0.010
CBQ-W whiplash	1.92	0.68	0.57	3.27	0.19	2.813	0.006
PCS	0.29	0.07	0.15	0.42	0.37	4.160	<0.001
Constant	−8.43	3.60	−15.57	−1.30		−2.340	0.021
Dependent variable: neck disability index at Q2, independent variables from Q2							
Age	0.09	0.06	−0.02	0.20	0.13	1.633	0.107
Gender	0.29	1.48	−2.67	3.24	0.02	0.192	0.848
CBQ-W muscular	1.61	0.86	−0.10	3.32	0.16	1.872	0.065
CBQ-W whiplash	3.00	0.66	−1.69	4.31	0.38	4.558	<0.001
PCS	0.34	0.07	0.21	0.47	0.45	5.216	<0.001
Constant	−4.44	3.32	−11.05	2.17		−1.338	0.185
Dependent variable: neck disability index at Q3, independent variables from Q3							
Age	0.05	0.06	−0.06	0.17	0.09	0.924	0.359
Gender	−1.74	1.87	−5.49	2.01	−.10	−0.928	0.358
CBQ-W severe injury	5.09	2.01	1.06	9.12	0.30	2.531	0.014
CBQ-W whiplash	2.39	0.73	0.92	3.86	0.33	3.260	0.002
PCS	0.19	0.09	0.01	0.36	0.26	2.159	0.035
Constant	−0.85	3.83	−8.53	6.83		−0.223	0.825

Dependent variable: Neck Disability Index at Q1, Q2, and Q3. Explanatory variables from Q1, Q2, and Q3, respectively.

After backward stepwise elimination, while retaining age and gender. Model 1 (Q1):  $R^2 = 0.48$ . Model 2 (Q2):  $R^2 = 0.55$ . Model 3 (Q3):  $R^2 = 0.55$ .

Variables entered at step 1: age, gender, CBQ-W Psychological, CBQ-W Severe Injury, CBQ-W Vertebral, CBQ-W Muscular, CBQ-W Whiplash, PCS total score.

In line with previous research, more severe initial complaints were related to the persistence of whiplash at both 6 and 12 months follow-up.<sup>3,4,34</sup>

Most importantly for the present context, the results show that attributing neck complaints to whiplash has a predictive value over and above the intensity of initial complaints. Therefore, independent of the severity of initial complaints, attributing the perceived complaints to

whiplash seems to have a detrimental influence on the prognosis. Although earlier studies have argued that symptom expectation, obligatory after attributing complaints to the medico-cultural entity “whiplash” could be responsible for the development of chronic whiplash complaints, the present study is the first to actually show a negative prognostic effect of attributing complaints to whiplash.<sup>24-26,35</sup>

**Table 5. Multiple Logistic Regression Model**

						95.0% CI	
Variable	Coefficient (B)	Standard Error	Wald X <sup>2</sup>	P	Odds Ratio	Lower	Upper
Dependent variable: postwhiplash syndrome at Q2							
Age	−0.03	0.02	1.53	0.216	0.974	0.933	1.016
Gender	0.58	0.57	1.03	0.310	1.792	0.582	5.520
Neck disability index	0.18	0.05	12.54	<0.001	1.197	1.084	1.323
CBQ-W psychological	1.47	0.52	7.93	0.005	4.335	1.562	12.030
CBQ-W vertebral	1.30	0.47	7.70	0.006	3.686	1.467	9.258
CBQ-W whiplash	1.23	0.38	10.34	0.001	3.430	1.618	7.272
PCS	−0.12	0.04	8.24	0.004	0.885	0.814	0.962
Constant	−7.29	1.84	15.61	<0.001	0.001		
Dependent variable: postwhiplash syndrome at Q3							
Age	0.01	0.02	0.09	0.765	1.006	0.966	1.048
Gender	0.53	0.58	0.83	0.362	1.695	0.544	5.276
Neck disability index	0.15	0.04	10.86	0.001	1.156	1.061	1.260
CBQ-W psychological	0.98	0.46	4.63	0.031	2.670	1.091	6.534
CBQ-W vertebral	0.84	0.44	3.70	0.055	2.307	0.984	5.411
CBQ-W whiplash	0.98	0.35	7.64	0.006	2.657	1.329	5.314
PCS	−0.06	0.04	7.64	0.097	0.942	0.878	1.011
Constant	−7.19	1.78	16.34	<0.001	0.001		

Dependent variable postwhiplash syndrome at Q2 and Q3. Explanatory variables from Q1.

After backward stepwise elimination, while retaining age and gender. Model 1 (Q2):  $R^2 = 0.41$  (Cox & Snell), 0.56 (Nagelkerke). Model  $\chi^2$  (7) = 61.67. Model 2 (Q3):  $R^2 = 0.39$  (Cox & Snell), 0.52 (Nagelkerke). Model  $\chi^2$  (7) = 52.02. Variables entered at step 1: age, gender, NDI, paresthesia, radiating pain to the arms, CBQ-W Psychological, CBQ-W Severe Injury, CBQ-W Vertebral, CBQ-W Muscular, CBQ-W Whiplash, PCS total score.

The finding that attributing early complaints to whiplash is an important factor with regard to concurrent disability and prognosis not only supports theories regarding the potential influence of cultural embedded causal beliefs, but also has important implications for management and treatment. The present findings suggest modifying symptom expectations regarding whiplash and altering the causal attribution of initial myogenic neck complaints as 2 possible therapeutic strategies.

Altering symptom expectation is a cultural process that should be employed at the population level, typically requiring educational campaigns and professional guidelines.<sup>36–38</sup> Although this could lead to a broad and definitive strategy at the population level, it is to be expected that this will be a slow process taking several years. Altering causal beliefs is an individual process that can readily be employed by developing a cognitive behavioral intervention aiming at modifying these specific causal convictions.

The present findings also indicate that attributing initial complaints to psychological factors has additional prognostic value regarding the persistence of disability after 1 year. This finding is consistent with previous research showing that early anxiety-related distress was related to delayed recovery from postwhiplash syndrome.<sup>13</sup> Cognitive behavioral interventions may also be helpful to reduce the influence of this type of dysfunctional convictions.

Finally, it was found that attributing early complaints to vertebral causes is related to persistent complaints at 6 months and with borderline significance at 12 months follow-up. This seems especially important since physiotherapy and/or manual therapies concentrating on alleged vertebral causes are quite common in acute whiplash.<sup>39</sup> In light of the fact that, by definition, no vertebral abnormalities are found in common whiplash, our results suggest that a therapy implicitly suggesting a vertebral cause could have adverse effects by fuelling dysfunctional beliefs.

Some comments are in order with respect to this study's limitations. All findings regarding the CBQ-W should be interpreted with care since the connotations regarding whiplash are highly culturally dependent. It could well be that this same questionnaire in a different population, especially with different cultural beliefs regarding neck complaints after motor vehicle accidents, would lead to different results.<sup>27,28</sup> It would therefore be beneficial to investigate expectations and beliefs regarding whiplash in relation to causal beliefs in different populations.<sup>25,26</sup>

In addition, the present sample consisted of participants who had initiated compensation claim procedures. However, the threshold for starting such procedures is low in the Netherlands, there seems to be no strong reason to suspect that this introduced a bias toward patients whose complaints were more serious.<sup>40</sup> Nevertheless, some studies have found that compensation is a critical factor to consider when studying postwhiplash syn-

drome.<sup>41,42</sup> Therefore, the personal injury claimant context should be taken into account when interpreting our findings. Furthermore, since the exact nature and expectations of compensation may vary greatly from country to country, we advise caution when extrapolating results from one population to another.

To conclude, the present results indicate that causal beliefs have important prognostic value for the course of postwhiplash symptoms. Moreover, the pattern of findings supports the view that an early conviction that neck complaints are caused by the medico-cultural entity "whiplash" has a detrimental influence on the course of symptoms and may contribute to delayed recovery.

### ■ Key Points

- The role of pain catastrophizing and causal beliefs in whiplash.
- Attributing initial neck complaints to whiplash was found to predict the persistence of disability, over and above the severity of the initial complaints.
- Pain catastrophizing is predominantly related to concurrent disability.
- Causal beliefs may play a major role in the perceived disability and course of neck complaints after motor vehicle accidents.

### References

1. Versteegen GJ, Kingma J, Meijler WJ, et al. Neck sprain in patients injured in car accidents: a retrospective study covering the period 1970–1994. *Eur Spine J* 1998;7:195–200.
2. Mayou R, Bryant B. Outcome of 'whiplash' neck injury. *Injury* 1996;27:617–23.
3. Buitenhuis J, Spanjer J, Fidler V. Recovery from acute whiplash: the role of coping styles. *Spine* 2003;28:896–901.
4. Buitenhuis J, Jaspers JP, Fidler V. Can kinesiophobia predict the duration of neck symptoms in acute whiplash? *Clin J Pain* 2006;22:272–7.
5. Barsky AJ, Borus JF. Functional somatic syndromes. *Ann Intern Med* 1999;130:910–21.
6. Berry H. Chronic whiplash syndrome as a functional disorder. *Arch Neurol* 2000;57:592–4.
7. Gozzard C, Bannister G, Langkamer G, et al. Factors affecting employment after whiplash injury. *J Bone Joint Surg Br* 2001;83:506–9.
8. Athanasou JA. Return to work following whiplash and back injury: a review and evaluation. *Med Leg J* 2005;73:29–33.
9. Vlaeyen JW, Kole-Snijders AM, Boeren RG, et al. Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance. *Pain* 1995;62:363–72.
10. Leeuw M, Goossens ME, Linton SJ, et al. The fear-avoidance model of musculoskeletal pain: current state of scientific evidence. *J Behav Med* 2007;30:77–94.
11. Raak R, Wallin M. Thermal thresholds and catastrophizing in individuals with chronic pain after whiplash injury. *Biol Res Nurs* 2006;8:138–46.
12. Vangronsveld K, Damme SV, Peters M, et al. An experimental investigation on attentional interference by threatening fixations of the neck in patients with chronic whiplash syndrome. *Pain* 2006;127:121–8.
13. Buitenhuis J, de Jong PJ, Jaspers JP, et al. Relationship between posttraumatic stress disorder symptoms and the course of whiplash complaints. *J Psychosom Res* 2006;61:681–9.
14. Sullivan MJ, Pivik J. The pain catastrophizing scale: development and validation. *Psychol Assess* 1995;7:524–32.
15. Sullivan MJ, Thorn B, Haythornthwaite JA, et al. Theoretical perspectives on the relation between catastrophizing and pain. *Clin J Pain* 2001;17:52–64.
16. Sullivan MJ, Stanish W, Waite H, et al. Catastrophizing, pain, and disability in patients with soft-tissue injuries. *Pain* 1998;77:253–60.

17. Sullivan MJ, Stanish W, Sullivan ME, et al. Differential predictors of pain and disability in patients with whiplash injuries. *Pain Res Manag* 2002;7:68–74.
18. Severeijns R, Vlaeyen JW, van den Hout MA, et al. Pain catastrophizing predicts pain intensity, disability, and psychological distress independent of the level of physical impairment. *Clin J Pain* 2001;17:165–72.
19. Vercoulen JH, Swanink CM, Fennis JF, et al. Prognosis in chronic fatigue syndrome: a prospective study on the natural course. *J Neurol Neurosurg Psychiatry* 1996;60:489–94.
20. Butler JA, Chalder T, Wessely S. Causal attributions for somatic sensations in patients with chronic fatigue syndrome and their partners. *Psychol Med* 2001;31:97–105.
21. Rief W, Nanke A, Emmerich J, et al. Causal illness attributions in somatoform disorders: associations with comorbidity and illness behavior. *J Psychosom Res* 2004;57:367–71.
22. Eifert GH, Hodson SE, Tracey DR, et al. Heart-focused anxiety, illness beliefs, and behavioral impairment: comparing healthy heart-anxious patients with cardiac and surgical inpatients. *J Behav Med* 1996;19:385–99.
23. Ferrari R. Whiplash cultures. *CMAJ* 1999;161:368.
24. Ferrari R, Lang C. A cross-cultural comparison between Canada and Germany of symptom expectation for whiplash injury. *J Spinal Disord Tech* 2005;18:92–7.
25. Ferrari R, Constantoyannis C, Papadakis N. Laypersons' expectation of the sequelae of whiplash injury: a cross-cultural comparative study between Canada and Greece. *Med Sci Monit* 2003;9:CR120–CR124.
26. Ferrari R, Obelieniene D, Russell A, et al. Laypersons' expectation of the sequelae of whiplash injury. A cross-cultural comparative study between Canada and Lithuania. *Med Sci Monit* 2002;8:CR728–CR734.
27. Schrader H, Obelieniene D, Bovim G, et al. Natural evolution of late whiplash syndrome outside the medicolegal context. *Lancet* 1996;347:1207–11.
28. Obelieniene D, Schrader H, Bovim G, et al. Pain after whiplash: a prospective controlled inception cohort study. *J Neurol Neurosurg Psychiatry* 1999;66:279–83.
29. Partheni M, Constantoyannis C, Ferrari R, et al. A prospective cohort study of the outcome of acute whiplash injury in Greece. *Clin Exp Rheumatol* 2000;18:67–70.
30. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain* 2000;85:317–32.
31. Vernon H, Mior S. The neck disability index: a study of reliability and validity. *J Manipulative Physiol Ther* 1991;14:409–15.
32. van Damme S, Crombez G, Vlaeyen JW, et al. De pain catastrophizing scale: psychometrische karakteristieken en normering. *Tijdschrift Voor Gedragstherapie* 2000;3:209–20.
33. Crombez G, Vlaeyen JW, Heuts PH, et al. Pain-related fear is more disabling than pain itself: evidence on the role of pain-related fear in chronic back pain disability. *Pain* 1999;80:329–39.
34. Scholten-Peeters GG, Verhagen AP, Bekkering GE, et al. Prognostic factors of whiplash-associated disorders: a systematic review of prospective cohort studies. *Pain* 2003;104:303–22.
35. Ferrari R, Schrader H. The late whiplash syndrome: a biopsychosocial approach. *J Neurol Neurosurg Psychiatry* 2001;70:722–6.
36. McClune T, Burton AK, Waddell G. Evaluation of an evidence based patient educational booklet for management of whiplash associated disorders. *Emerg Med J* 2003;20:514–7.
37. Motor Accidents Authority. *Guidelines for the Management of Whiplash-Associated Disorders*. Sydney, Australia: Motor Accidents Authority, Claims Advisory Service; 2001.
38. Carlsson I. *The Whiplash Commission Final Report*. Stockholm, Sweden: Whiplashkommissionen; 2005.
39. Scholten-Peeters GG, Bekkering GE, Verhagen AP, et al. Clinical practice guideline for the physiotherapy of patients with whiplash-associated disorders. *Spine* 2002;27:412–22.
40. Swartzman LC, Teasell RW, Shapiro AP, et al. The effect of litigation status on adjustment to whiplash injury. *Spine* 1996;21:53–8.
41. Joslin CC, Khan SN, Bannister GC. Long-term disability after neck injury. A comparative study. *J Bone Joint Surg Br* 2004;86:1032–4.
42. Gun RT, Osti OL, O'Riordan A, et al. Risk factors for prolonged disability after whiplash injury: a prospective study. *Spine* 2005;30:386–91.